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August 20, 2020

Todd Slater
Legacy Site Services LLC
665 Stockton Drive, Suite 100
Exton, PA 19341

Subject: 2020 GWET System Effectiveness Evaluation
Arkema Facility, ECSI No. 398

Dear Mr. Slater:

The Oregon Department of Environmental Quality received the *GWET System Effectiveness Evaluation* (GWET SEE) dated April 17, 2020. The report was prepared by Environmental Resources Management (ERM) for Legacy Site Services LLC (Legacy). ERM submitted the GWET SEE to provide an update on the system, evaluate the extent of capture achieved, and propose actions to improve hydraulic capture.

The GWET system represents the primary method of groundwater contaminant source control at the Arkema site, a high priority project in the Portland Harbor Superfund Site. The system is a hydraulic containment system designed with the objective of preventing contaminated groundwater behind the slurry wall from migrating to the river. To achieve this objective, the wells must extract groundwater at rates greater than or equal to the groundwater flux through the alluvial waterbearing zones lying immediately upgradient of the wall. The performance criteria for the barrier wall-groundwater extraction system is: 1) inward hydraulic gradients, and 2) an absence of mounding behind the wall. Although, neither of these performance criteria have been achieved at the Arkema site, they will remain the primary lines of evidence in evaluating source control performance.

As documented in DEQ's review[1] of the last GWET SEE[2], the existing groundwater extraction system is not capable of achieving or sustaining the required inward gradients and the treatment plan remains unreliable. The adaptive management modifications implemented over the past year have been ineffective in increasing the groundwater extraction rate. Migration of contamination around and possibly under the wall remains an ongoing concern given the lack of hydraulic control. Anticipated plans for modifications to management of groundwater have not been submitted as planned and continue to be delayed.

The GWET system is unlikely to provide control of the upland source area prior to the implementation of the in-water remedial action Legacy is completing under the oversight of the U.S. Environmental Protection Agency (EPA). DEQ recommends the in-water remedial design incorporate the lack of upland source control into the in-water design. Future submittals to EPA

[1] DEQ. 2019. Letter to Todd Slater, Re: DEQ Review "Draft GWET System Effectiveness Evaluation Report" Oregon Department of Environmental Quality. May 31, 2019.
[2] ERM. 2018. *Draft GWET System Effectiveness Evaluation*. Environmental Resources Management. September 2018.

should acknowledge the failure of the GWET system to control upland sources to the river. In addition, the upland Feasibility Study will need to consider source removal and other remedial options that do not really on the current GWET system.

DEQ has the following specific comments on the GWET SEE.

1. **Section 4.1.5 Groundwater Recovery Pump Settings.** This section indicates extracted groundwater from wells RW-07 and RW-08 is recirculated. Provide additional information on the recirculation process and what the process entails.

2. **Section 7. System Optimization.** This section indicates a groundwater extraction enhancement work plan will be presented in April or May 2020. DEQ has not received this plan as of the date of this letter.

EPA and partners have reviewed the GWET SEE. EPA did not have comments on the report. Comments from the Five Tribes are enclosed and need to be addressed in the next annual SEE.

Please contact me at 503-229-6748 or by email at Daugherty.Katie@deq.state.or.us if you have any questions.

Sincerely,

Katie Daugherty

Katie Daugherty, R.G.
Project Manager
NWR Cleanup Program

Enclosure (Five Tribes Comments)

cc: Administrative File
ecc David Lacey, DEQ
Henning Larsen, DEQ
Hunter Young, EPA
Jennifer Hart, Industrial Economics, Inc.
Brendan Robinson, ERM
Josh Hancock, ERM
Erica Whiting, ERM

IEc

MEMORANDUM | July 22, 2020

TO Katie Daugherty, Oregon Department of Environmental Quality (DEQ)

FROM Peter Shanahan, HydroAnalysis, Inc. (HAI); Jennifer Hart and Gail Fricano, Industrial Economics, Inc. (IEc)

SUBJECT Comments on the Arkema Facility Groundwater Extraction and Treatment (GWET) System Effectiveness Evaluation

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ERM prepared this report for Legacy Site Services LLC (LSS) on their most recent evaluation of the effectiveness of the groundwater extraction and treatment (GWET) system, which has been in place since 2014 at the former Arkema facility in Portland, Oregon (ERM, 2020). This review of the *GWET System Effectiveness Evaluation* (SEE; dated April 17, 2020) has been prepared on behalf of the Five Tribes.[1] We previously reviewed an earlier SEE report (ERM, 2018) and indicated in our written comments that the system was failing to perform as intended.

GENERAL COMMENTS

1. This report (ERM, 2020) is a substantial improvement over the 2018 report (ERM, 2018). Whereas the 2018 report stressed the degree to which the GWET system was effective and seemed to minimize problems, this report very appropriately concludes that the current system is not meeting the groundwater capture objectives for the system and discusses ongoing and future work to achieve the desired performance. While work to improve system performance is overdue, we are pleased to see that it is now underway.

2. The existing system has not performed as intended due to a variety of problems including well fouling and equipment failures. The SEE report notes numerous instances in which various extraction wells were out of service for extended periods. The apparent slow response to these problems, as well as the delayed acknowledgement that the system is not meeting objectives, suggests lack of commitment by LSS in maintaining and operating the remedial system. This is a significant concern.

SPECIFIC COMMENTS

3. Section 4.1.2 – The second paragraph of this section discusses a variety of potential causes for well fouling but fails to reach any conclusions. We recommend that the report include a summary of the conclusions.

4. Section 4.1.3 – The second paragraph of this section begins "As noted above, pumping and surging alone had limited effect on well recovery rates during over

[1] The five tribes are the Confederated Tribes of The Grand Ronde Community of Oregon, the Nez Perce Tribe, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation of Oregon.

pumping…" It does not appear that pumping and surging are discussed earlier in the report. We recommend reorganizing the text to provide this information before Section 4.1.3, or the text in Section 4.1.3 should be revised for accuracy.

5. Section 4.1.4 – This section details the operational history of the various extraction wells. Some wells were out of service for extended periods owing to failing equipment. The apparently slow response to these problems is a significant concern. We recommend the report describe corrective actions to maintain and repair equipment.

6. Section 5.1 – In the second paragraph on page 16, the report discusses "a localized pressure zone." We recommend that this discussion be enhanced to provide more detail as to the nature and spatial character of this zone. The text states the zone "is hydraulically isolated from the Shallow and Intermediate Zones within this area of Site." It is unclear if this describes vertical separation (i.e., the localized pressure zone is some sort of perched zone) or horizontal separation. We recommend that the localized pressure zone be described more completely. The discussion may be improved by a graphical depiction of the stratigraphy thought to be responsible for this zone. In addition, we recommend adding a discussion of the implications of such a localized zone for achieving remediation objectives.

7. Section 5.1.1 – The report states "The lower groundwater elevations observed during this reporting period explain the lower recovery rates in this reporting period compared to the previous reporting period." This statement appears to be incomplete in that the immediately preceding discussion makes clear that fouling of the wells plays a role in lowering extraction rates. Also, the reporting period is not unequivocally identified in the report but is implied to be August 2018 through February 2020. We recommend that somewhere in the report a definitive tabulation of the various reporting periods be provided.

8. Table 3 – We recommend that color shading, or some other identifier, be used to distinguish the "Before Redevelopment" and "After Redevelopment" data that are used to compute the extraction rates included in the final two columns of the table.

9. Section 6 – This section seems to indicate that the groundwater model has been abandoned altogether. However, Section 7 indicates that there is likely to be a substantial redesign of the extraction system in order to correct the deficiencies in the current system. We believe strongly that the groundwater model can be an effective tool for design even if is not used for subsequent evaluation of system performance.

10. We did not complete a detailed review of the performance monitoring reports appended to the SEE report. However, we did note a seeming inconsistency in the groundwater contour maps. The figure legends indicate that active recovery wells were not used in contouring. However, many maps show these wells surrounded by contours that could only have been drawn if the (lower) heads at the recovery wells were used in contouring. We recommend that this

contradiction be resolved. We also noted that hydraulic head is shown in the maps for active recovery wells in the performance monitoring reports through September 2019 but not thereafter. We believe that the head at pumping wells is information that is essential for understanding and interpreting system performance and recommend that it be shown on the groundwater contour maps.

REFERENCES

ERM, 2018. DRAFT GWET System Effectiveness Evaluation, Arkema Inc. Facility, Portland, Oregon. Prepared for: Legacy Site Services LLC. Environmental Resources Management, Portland, Oregon. September 2018.

ERM, 2020. GWET System Effectiveness Evaluation, Arkema Inc. Facility, Portland, Oregon. Prepared for: Legacy Site Services LLC. Environmental Resources Management, Portland, Oregon. April 17, 2020.